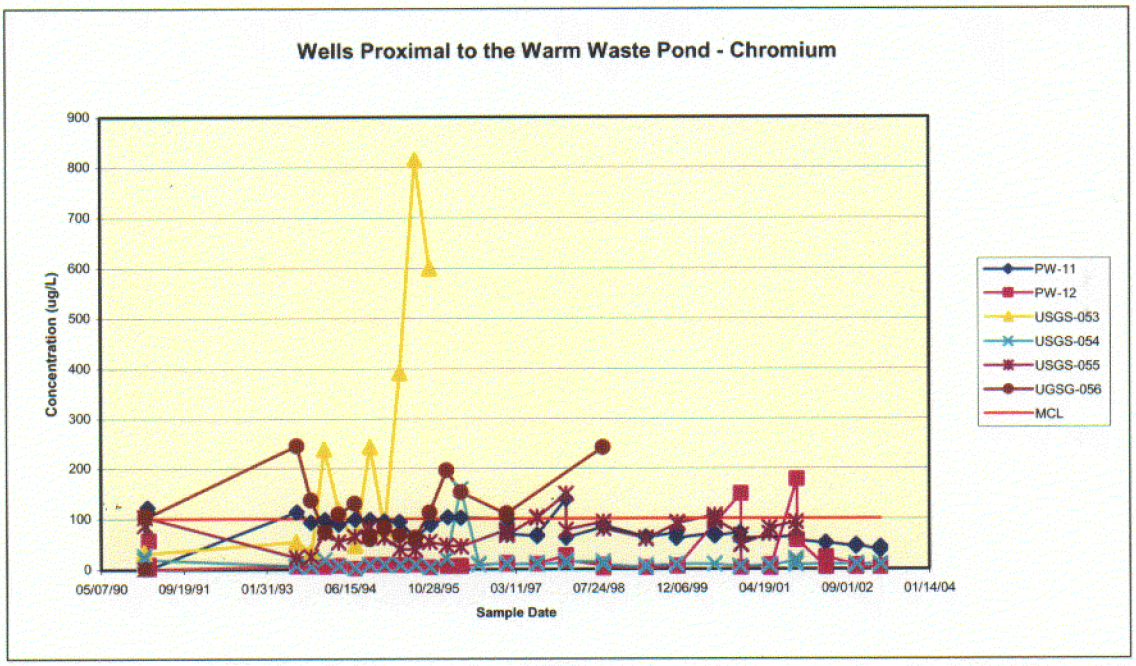

Figure 12. Chromium levels in wells proximal to the Warm Waste Pond.

8.3.2.2 Tritium. The MCL for tritium is 20,000 pCi/L, and it has a half-life of 12.3 years. Tritium, as an isotope of hydrogen, travels with groundwater and is considered an ideal conservative tracer. Reductions in the activity of measured tritium can result from both dilution and radioactive decay.

Activities of tritium measured in deep-perched wells proximal and distal to the Warm Waste Pond versus time are shown in Figures 13 and 14, respectively. All wells show a drastic decline in reported values for tritium since completion of the remedial actions (construction of the new evaporation pond). With source-term elimination, radioactive decay plays a significant role in decreasing activity. Without the addition of new tritium to the subsurface, it is unlikely that tritium activity will ever increase. Figures 15 and 16 are detailed plots of recent tritium activities for proximal and distal wells to the Warm Waste Pond, respectively. These plots show that although tritium is currently above the MCL for many wells, activities have declined steadily for the past 5 years in most wells. The exception is USGS-055, which had an unexplained spike during the summer of 1998, but has been declining since that time and went dry in the early spring of 2002.

Well PW-12 (Figure 15), although still well below the MCL, has shown a slight increase in tritium over the past few years.

8.3.2.3 Strontium. The MCL for Sr-90 is 8 pCi/L, and it has a half-life of 29 years. As indicated by its high soil-to-water distribution coefficients (K_d-24 mL/g), Sr-90 is less mobile in soil water than tritium (Dames & Moore 1993). Strontium is present primarily as a divalent cation, and thus it behaves similarly to dissolved calcium.

Figure 17 shows Sr-90 activities for wells proximal to Warm Waste Pond for the period of record. Activities for these wells peaked in the early 1970s. Figure 18 shows a detail of Sr-90 activities for deep-perched wells proximal to the Warm Waste Pond. Three of these wells show an increasing trend since 1998 (USGS-054, USGS-055, and PW-12).

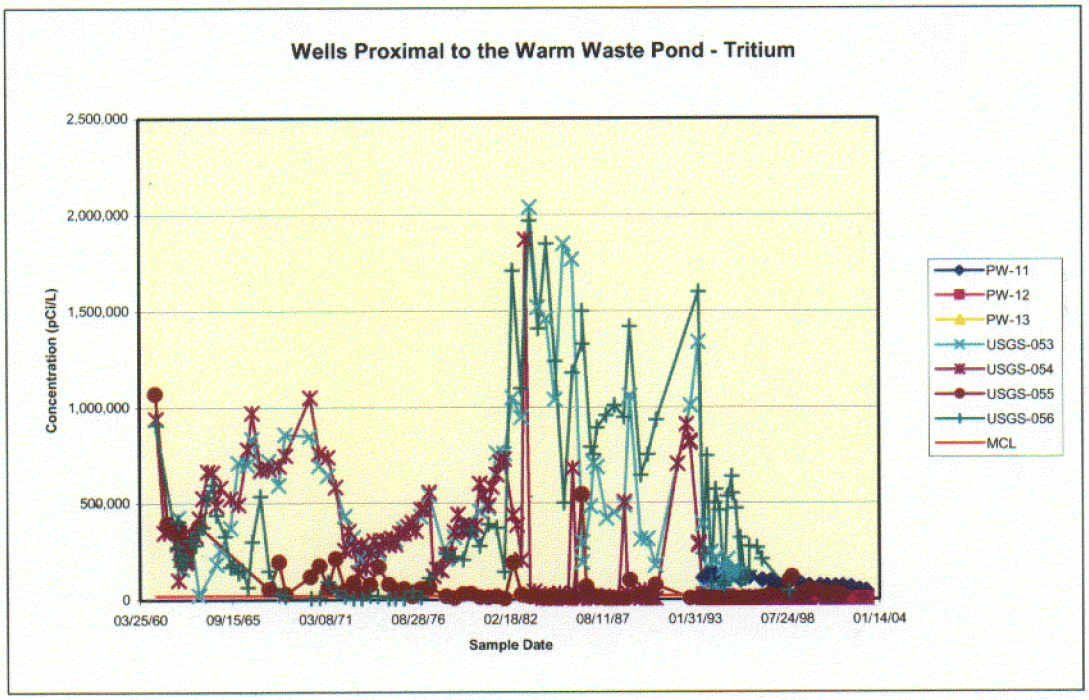

Figure 13. Tritium activities proximal to the Warm Waste Pond.

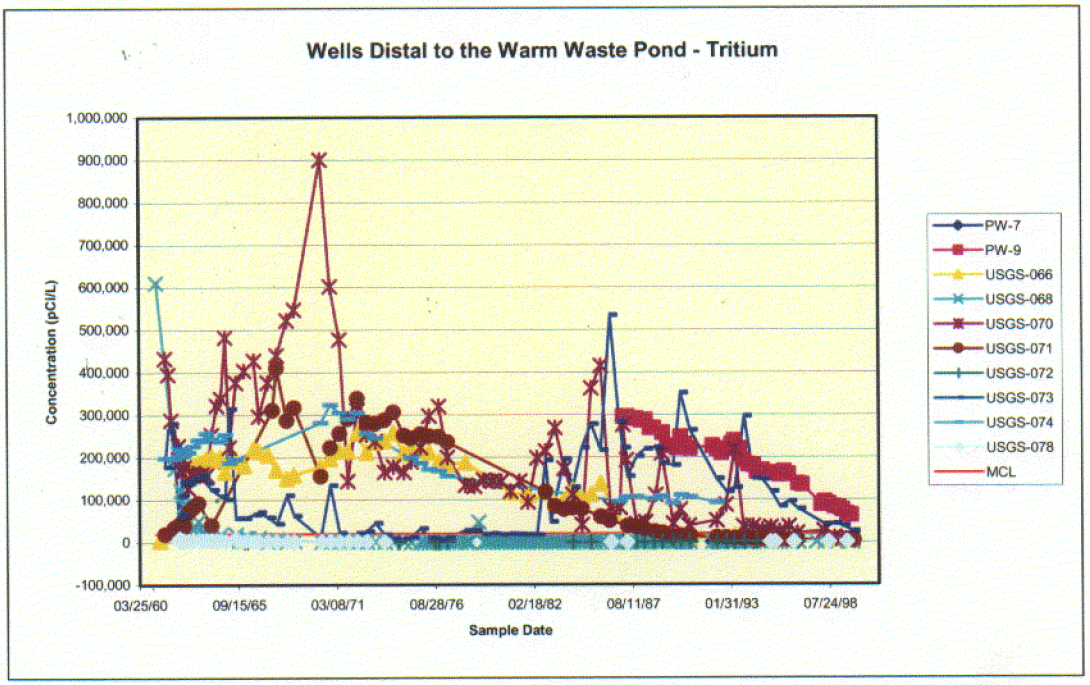

Figure 14. Tritium activities distal to the Warm Waste Pond.

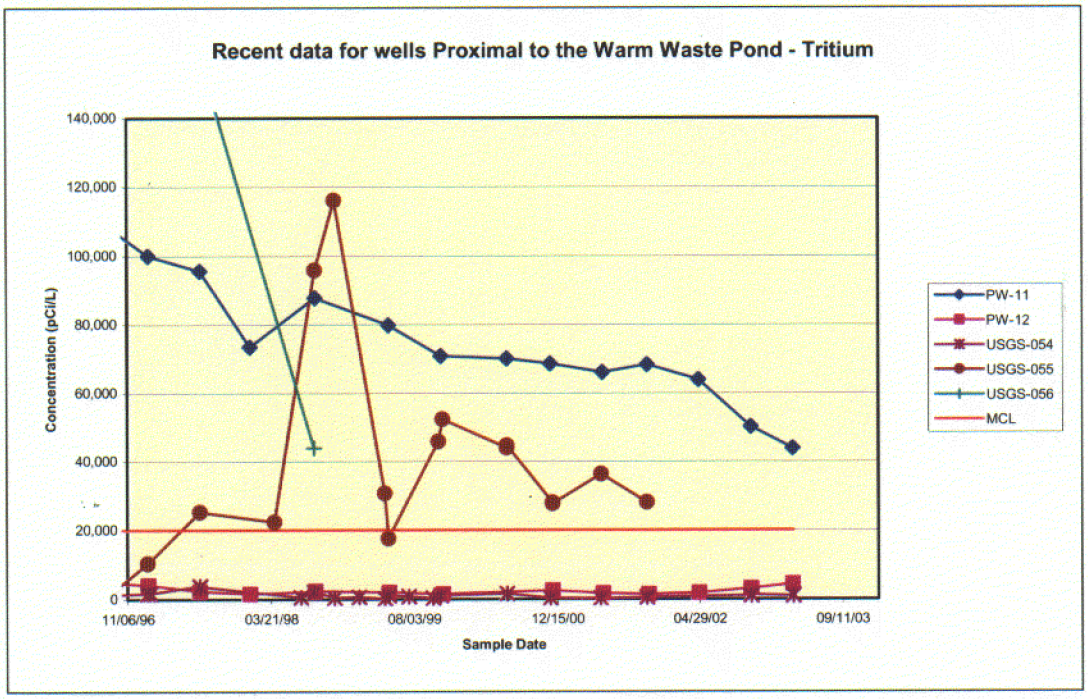

Figure 15. Recent tritium activities proximal to the Warm Waste Pond.

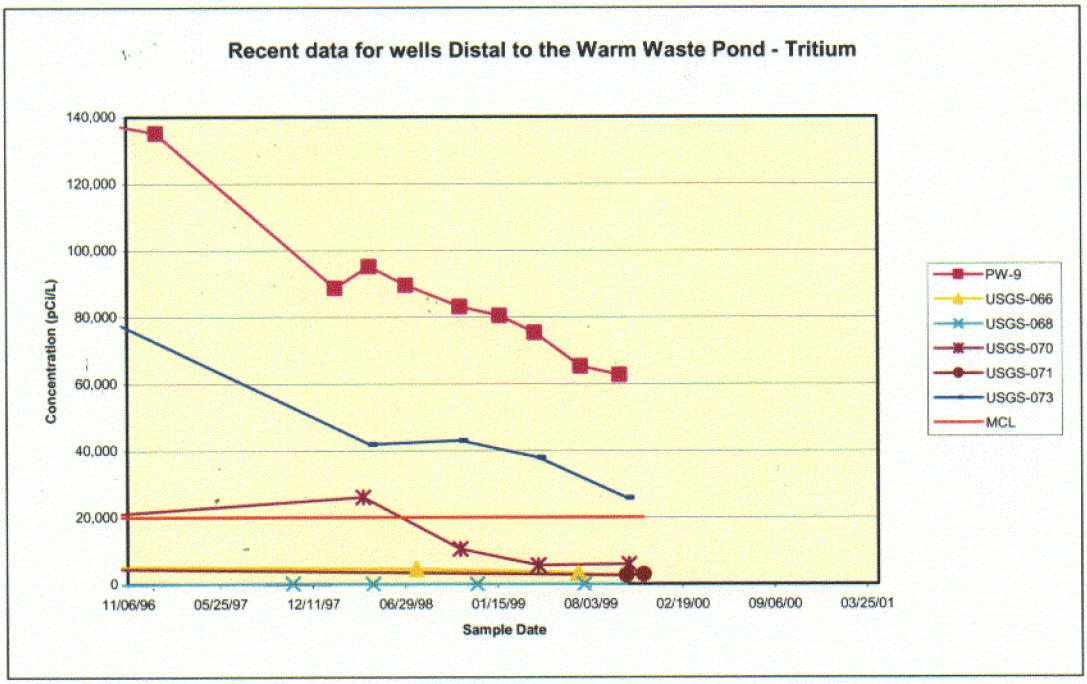

Figure 16. Recent tritium activities distal to the Warm Waste Pond.

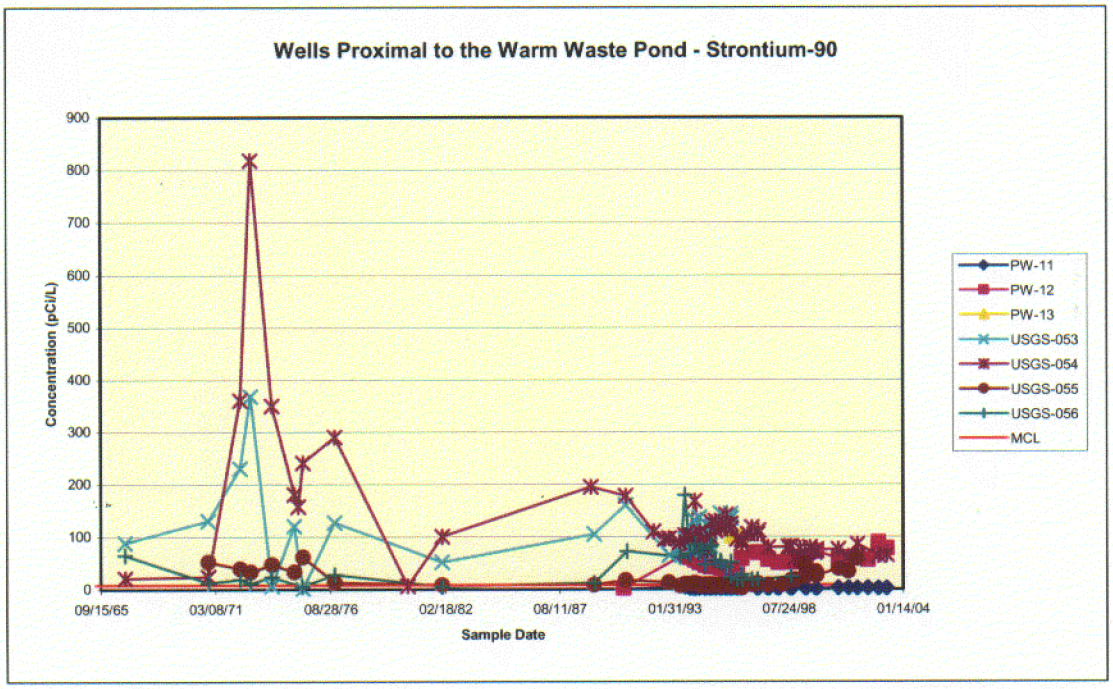

Figure 17. Strontium-90 concentrations proximal to the Warm Waste Pond.

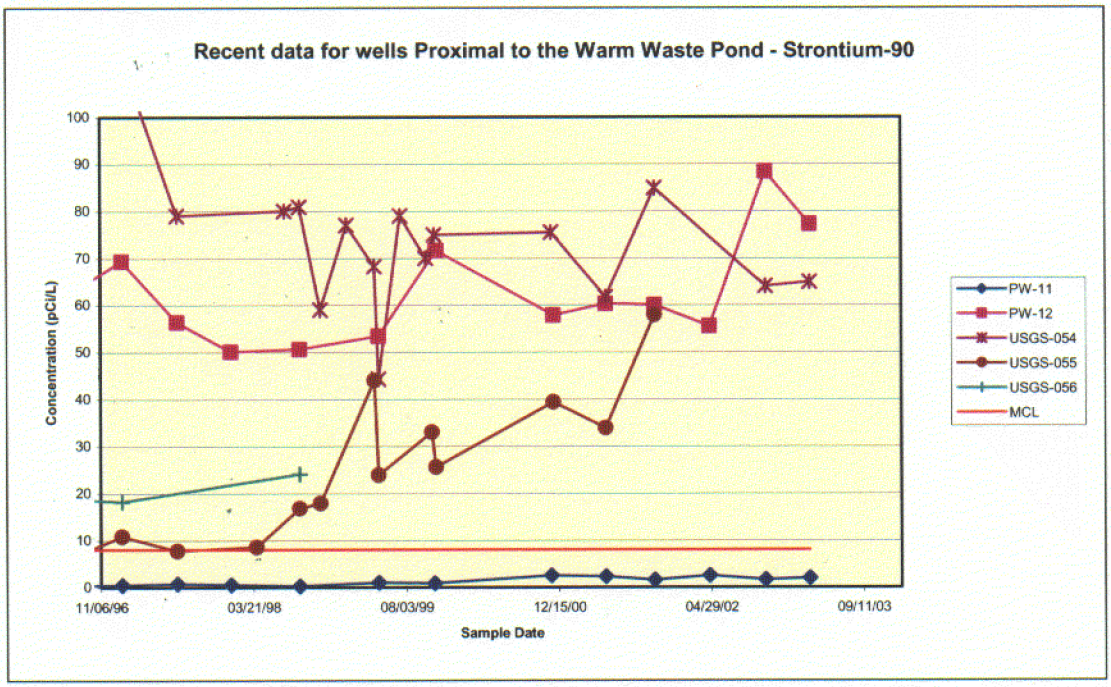

Figure 18. Recent data for strontium-90 concentrations proximal to the Warm Waste Pond.

Figure 19 shows Sr-90 activities for wells distal to the Warm Waste Pond for the period of record. Most of these wells showed a high activity in the early 1970s with a steady decline to near the detection limit in recent years. The exception is USGS-070, which has fluctuated above the MCL (8 pCi/L) at approximately 50 pCi/L for the past several decades. The reason for this high level is presently unknown, but it may be tied to operations at TRA or variations in natural infiltration events.

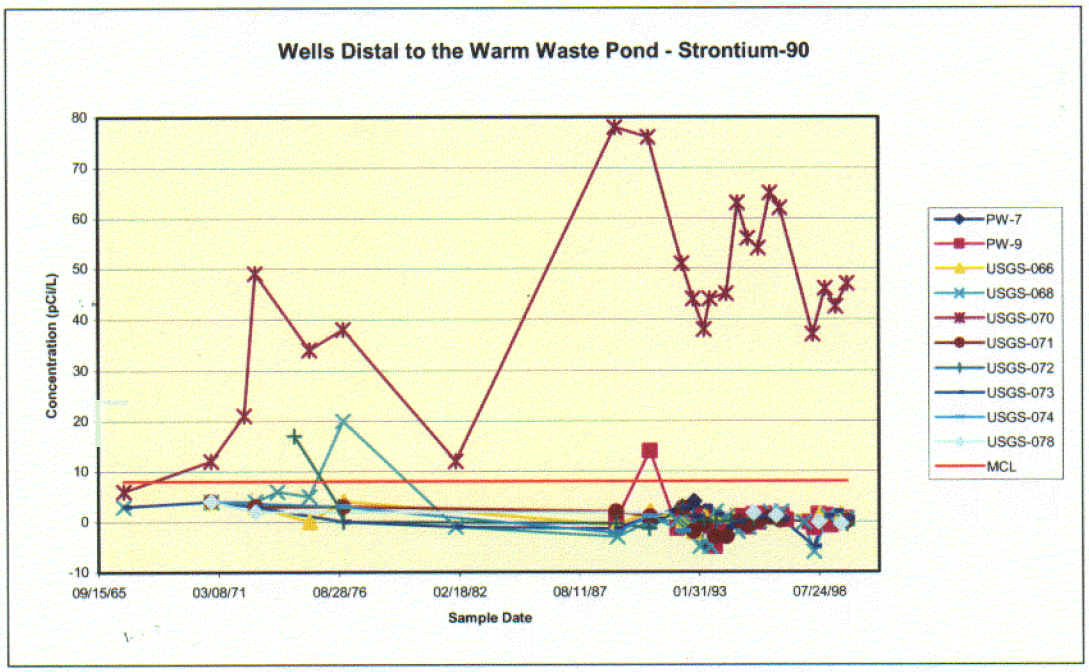

Figure 19. Strontium-90 concentrations distal to the Warm Waste Pond.

8.3.2.4 Cobalt-60. The MCL for Co-60 is 100 pCi/L, and it has a half-life of 5.2 years. It is relatively immobile in groundwater, as indicated by its high soil-to-water distribution coefficient (K_d 56 mL/g) (Dames & Moore 1993).

In general, Co-60 levels in the perched water have historically shown decreasing trends with the highest results in wells monitoring the deep-perched water proximal to the Warm Waste Pond (Figure 20). In recent years, most of the Co-60 levels have been below the MCL. One notable exception to the general trends of decreasing or fluctuating concentrations in the last 5 years occurs at PW-12. This well shows a marked increase in Co-60 over the last 2 years, going from a nearly undetectable concentration of 6.14+/-6.39 pCi/L in October 2001 to 330+/-18 pCi/L in March 2003 (see Figure 21). The reason for this increasing trend is presently unknown.

8.3.2.5 Diesel in PW-13. Diesel was discovered during the drilling of PW-13 in 1990. Floating product has been observed in this well intermittently since that time, and it has been the subject of several investigations. Subsequent to the initial discovery of contamination during the drilling of Well PW-13, a series of five additional water samples were collected between July 1993 and October 1995. Each of the samples was submitted for benzene, toluene, ethylbenzene, and xylene analysis, with the only constituent detected being ethylbenzene at concentrations ranging from 3.6 to 5.4 µg/L. On February 2, 2000, 14 in. of free product was discovered in the well. Over a period of 7 months, the thickness of free product in the well was checked, gradually declining from a high of 16 in. to a thickness of 1.5 in. on September 14, 2000. Additional samples have been collected from PW-13 in 2000 (no product thickness was observed) and 2001 (a dark-colored material was found during initial pumping, but no material was found as a

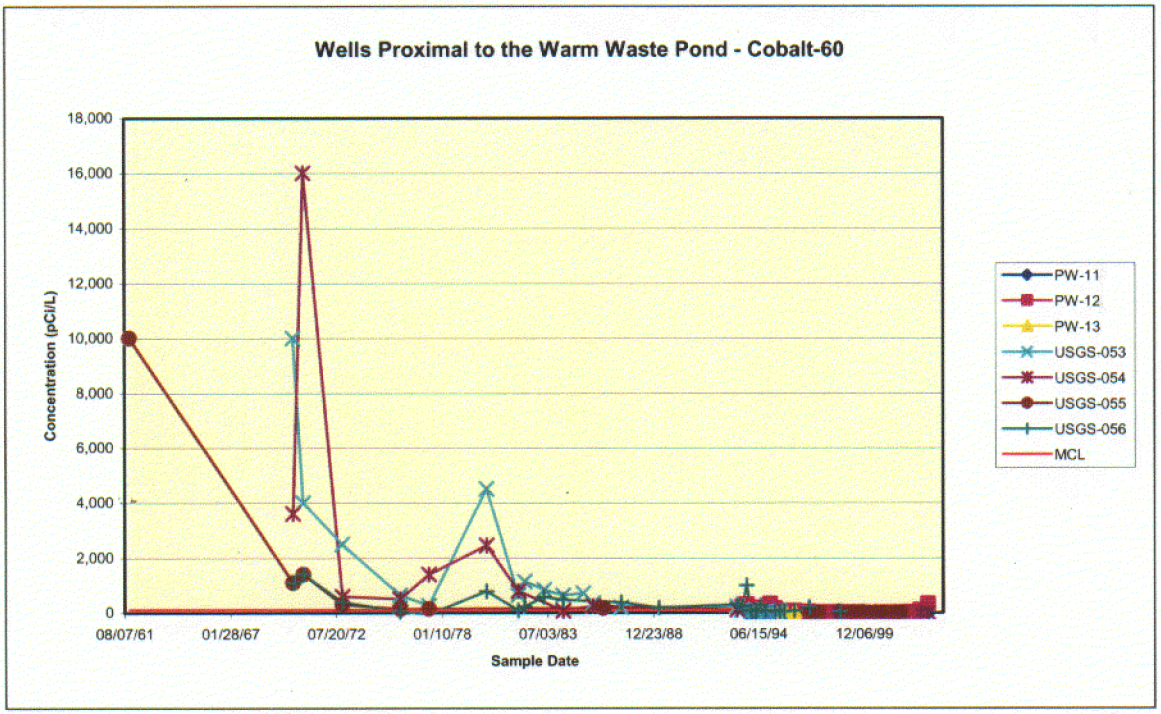

Figure 20. Historical Co-60 levels in perched water wells.

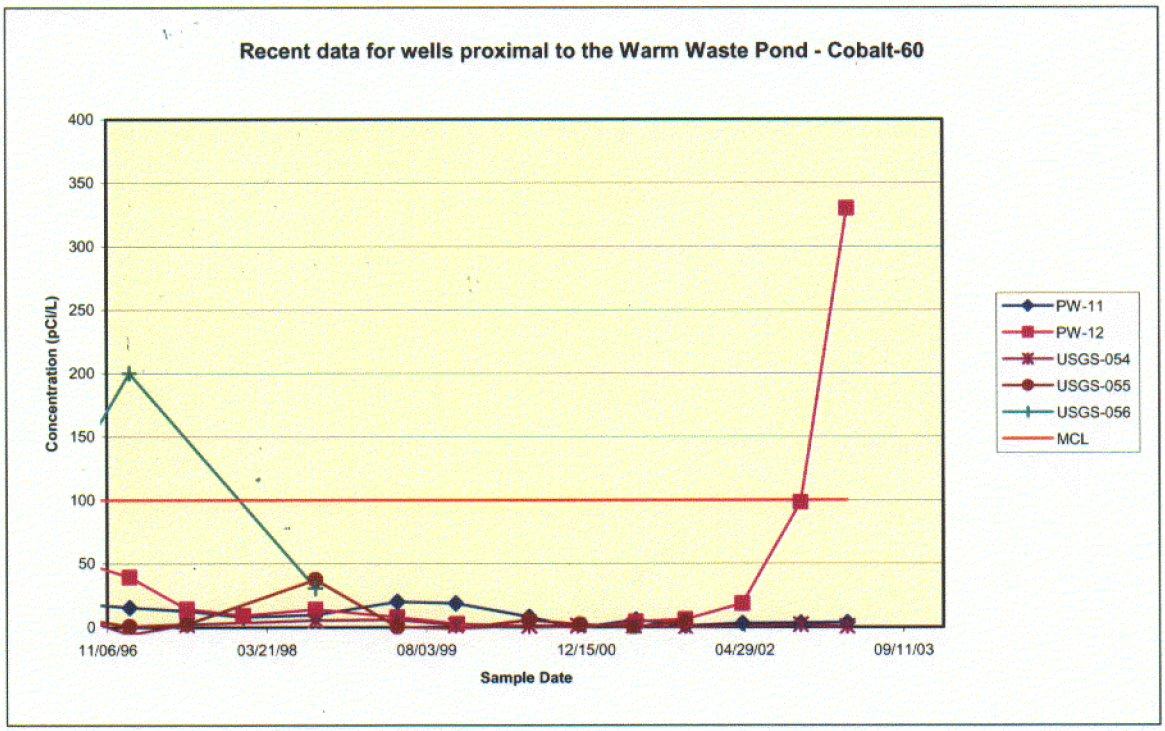

Figure 21. Recent Co-60 concentrations in the deep-perched zone.

floating layer). Based upon operating records including the operational mode of the emergency diesel system and the assumed maximum rates for the diesel transfer pumps, it was determined that a maximum of 2,000 gal of diesel had leaked. Based on the available analytical data, a groundwater model (GWSCREEN) was performed based on the assumption that the entire 2,000 gal of diesel had migrated to the aquifer. The results of the modeling determined that the diesel did not pose an unacceptable risk to human health and the environment.

Well PW-13 was sampled in June 2003 specifically for gamma emitting radioisotopes, strontium-90, and tritium. During sampling, it was noted that 0.9 ft of free product was in the well. The free product was not bailed out at this time. Funding approval has recently been received to begin investigation into the source and extent of the diesel during FY 2003. Pending funding approval for FY 2004, investigation into the diesel source will be completed and a report issued.

8.3.3 Summary of the Deep-Perched Water Analytical Review

Generally, chromium, tritium, Sr-90, and Co-60 have shown decreasing trends in deep-perched water wells over the past 5 years. Exceptions to the general decreasing trend include increasing or flat activities of Sr-90 in Wells PW-12, USGS-054, USGS-055, and USGS-070 and a recent increase of Co-60 in Well PW-12.

There is not enough data to determine what mechanisms are controlling fluctuating or increasing concentrations of contaminants of concern in the deep-perched water system. There are several plausible explanations, including (1) adsorptioddesorption occurring with the changing perched water levels; (2) changing flow pathways in response to remediation and fluctuations in discharge to the Cold Waste Pond (or alternating cells); (3) seasonal variations of natural infiltration at a local scale; **(4)** variations in water recharge from unidentified manmade sources; (5) lateral flux from the Big Lost River; or (6) potential leaks of contaminated water from unidentified sources. Because of the high K_d values of these contaminants and the fact that pre-Record of Decision modeling used similar concentrations in perched water to model impact to the aquifer, it seems unlikely that the downward transport of perched water containing Sr-90 or Co-60 could significantly impact the SRPA.

8.3.4 Snake River Plain Aquifer Analytical Review

Predicted concentrations of contaminants of concern in the SRPA were the focus **of** pre-Record of Decision modeling and the basis of agreements made by the Agencies regarding remedial actions at Waste Area Group 2. Strongly sorbed contaminants, such as Sr-90 and Co-60, will move slowly through sediments and basalts, which underlie the perched water zones. Radioactive decay, dilution, and dispersion will act to reduce the concentrations of contaminants reaching the aquifer. Because it is important to understand contaminant trends measured in post-Record **of** Decision monitoring and compare them to pre-Record of Decision modeling, this 5-year review presents detailed information on the contaminants of concern in the aquifer and, where applicable, directly compares trends to modeling predictions. The trends presented and compared to monitoring data on graphs in this report are for maximum concentrations of a particular contaminant anywhere in the aquifer.

The pre-Record of Decision model employed the TARGET computer code to simulate groundwater flow and transport in a two-dimensional model to characterize the flow and migration of contaminants between the ponds and the SRPA. The model was first calibrated to historic water levels in wells and to historic concentrations of tritium and chromium in the deep-perched water zone and the SRPA. The model was then used to predict the concentrations of the 14 contaminants of concern through time,' up to 125 years in the future. It was assumed that discharge to the Warm Waste Pond was discontinued in approximately a year (1992), and discharge to the Cold Waste Pond (CWP) was eliminated in 2007. A series of plots were generated showing the predicted concentrations of the

contaminants of concern from 1952 to 2115 in the upper 12.5 ft of the SRPA beneath TRA. The contaminants of concern that were predicted to attain peak concentration in the SRPA over the next 125 years are Sr-90, Cadmium, Cr, and tritium. The remaining contaminants of concern are retarded to the extent that they are predicted not to attain peak concentrations over the next 125 years (Dames & Moore 1992).

8.3.4.1 Chromium. Factors affecting the mobility of hexavalent chromium in the aquifer include: presence or absence of dissolved oxygen, pH, presence of other multivalent anions (sulfate, phosphate), absorbency of sediment surfaces. If dissolved oxygen is present, the pH is greater than 7, other multivalent anions are present, and the sediment surfaces are poor absorbents for hexavalent chromium, then hexavalent chromium is more mobile. If organic materials and/or dissolved iron (II) or sulfide is present, hexavalent chromium will be less mobile. Analytical data from groundwater samples obtained during routine groundwater monitoring by the USGS from April 2001 through October 2001 revealed that the pH in wells in the vicinity of TRA (MTR Test Well, Site-19, TRA Disposal Well, and USGS-076) is slightly alkaline, with an average pH of 7.975, indicating that chromium is soluble in the SRPA below the TRA. As discussed previously, filtered groundwater samples generally best represent actual dissolved chromium concentrations in groundwater. Unfiltered samples can often contain immobile chromium. Both types of samples are discussed in the following paragraphs.

Figure 22 shows unfiltered chromium concentrations compared to modeled predictions from 1985 to the present for the three aquifer wells that are immediately down gradient of the TRA facility. Results for filtered samples are shown in Figure 23. Unfiltered chromium samples show a general declining trend in aquifer groundwater. A peak appears in both USGS-065 and TRA-07 in August 1999. Most of the unfiltered sample data for TRA-06A are below the MCL (100 µg/L).

The pre-Record of Decision model predicted that chromium would fall below the MCL (100 µg/L) sometime near the year 2017. Fitting the unfiltered data with trend lines (linear) in Figure 22 (top) suggests that the maximum chromium groundwater concentration near TRA will drop below the MCL sometime between the years 2006 and 2018. The mean and standard deviation of unfiltered chromium sampled during 1990–2002 in Wells USGS-065, TRA-07, and TRA-06A are 172.0+/-20.4, 209.5+/-45.5, and 45.1+/-75.5 µg/L, respectively.

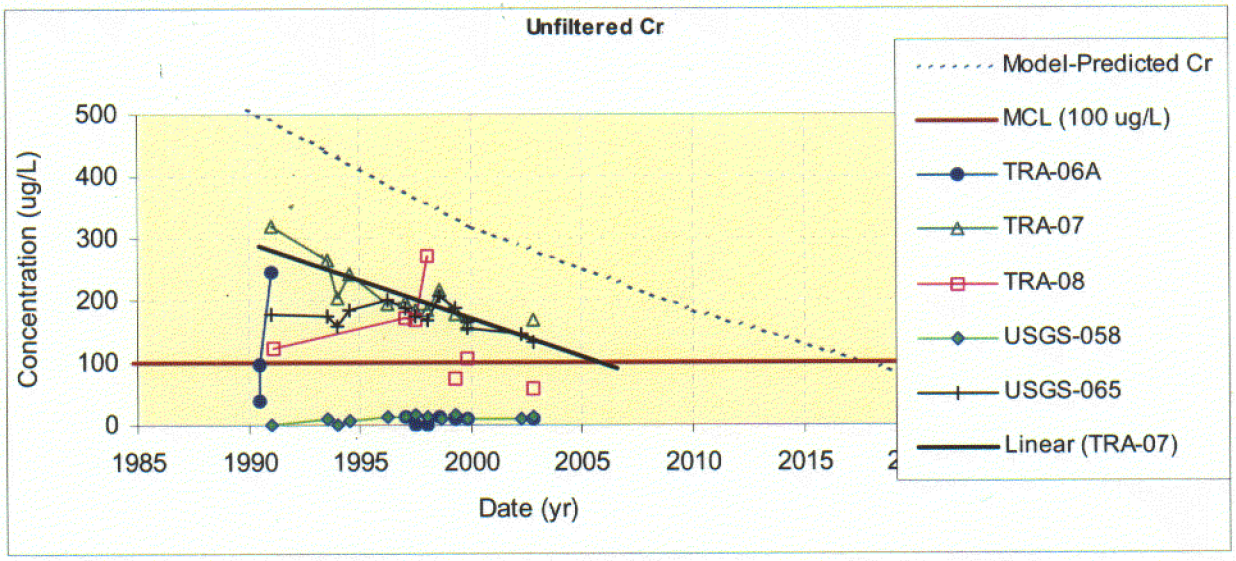

Figure 22. Unfiltered chromium concentrations compared to model predictions (1985 to present).

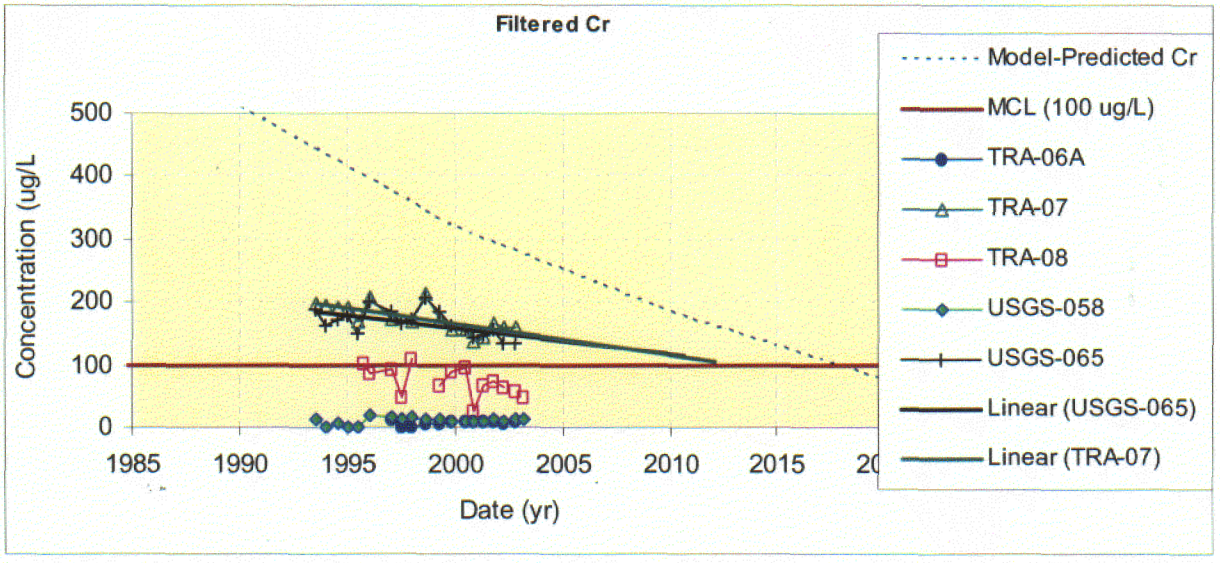

Figure 23. Recent trends in aquifer filtered chromium concentrations.

A similar straight-line trend fitted to the bottom plot in Figure 23 suggests that the filtered chromium concentrations in the aquifer will reach the MCL in about 2012. The projection of unfiltered chromium reaching the MCL before filtered chromium concentrations is probably related to the fact that earlier unfiltered data measurements are higher due to the presence of particulate chromium. The mean and standard deviation of filtered chromium sampled during 1990–2002 in Wells USGS-065, TRA-07, and TRA-06A are 163.9+/-23.3, 172.5+/-21.8, and 9.1+/-1.4 µg/L, respectively.

Hexavalent chromium is generally considered the most mobile form of chromium, and an analysis was made using the available data for hexavalent chromium for aquifer wells. The samples analyzed specifically for hexavalent chromium are plotted in Figure 24. Hexavalent chromium was measured below the MCL in all three wells (USGS-065, TRA-06A, and TRA-07) in 2003. A straight-line projection back to the previous data point suggests that groundwater concentrations of hexavalent chromium fell below the MCL sometime between 1999 and 2000. Because the wells were not sampled for hexavalent chromium between 1996 and 2000, additional sampling for hexavalent chromium is warranted to confirm the straight line projection depicted in Figure 24.

As previously described in this report, a thin lens of stagnant water (~8 ft thick) might be trapped between the water table and a shallow sedimentary interbed (as depicted in Figure 6). Both USGS-065 (8 ft thick) and TRA-07 (18 ft thick) tap this thin layer, and perhaps consequently, both have elevated levels of chromium when compared to TRA-06A. The thin, sedimentary interbed also might have served to isolate TRA-Disposal well wastewater containing chromium from mixing with aquifer water. Because of the restricted mixing across the sedimentary interbed, it might be appropriate to average the concentrations measured in the upper and lower zones to make a better comparison of monitoring data to modeling predictions, which assumed mixing in the aquifer's upper layer. The average of the mean value for filtered chromium measured in TRA-07 and TRA-06A over the past 12 years is 90.8 µg/L. This value is below the 100-µg/L MCL.

The projection of filtered chromium concentrations to reach the MCL by 2012 (Figure 23) is the best measure that the remedial actions at Waste Area Group 2 will be protective of human health and the environment in the long term. The fact that chromium concentrations are projected to reach the MCL without dilution, as assumed in the pre-Record of Decision model, indicates that the modeling approach was conservative and appropriate.

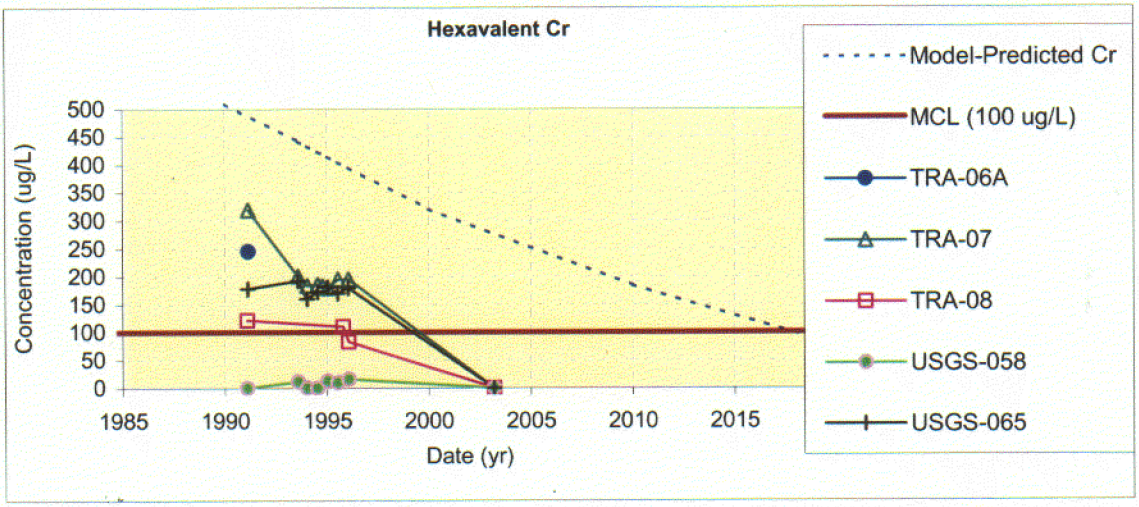

Figure 24. Recent trends in the aquifer's hexavalent chromium concentrations.

All other wells in the aquifer contain chromium concentrations well below the MCL. Figure 7-26 in Appendix G shows the chromium concentration over time for all aquifer wells. Most of these wells show flat or decreasing levels of chromium over the past 5 years of record. Chromium in these wells probably originated from the TRA-Disposal well, where large volumes of chromium were discharged directly to the aquifer.

8.3.4.2 Tritium. All groundwater wells in the SRPA are below the MCL for tritium (Appendix G, Figure 7-25). Most wells show declining trends; the exceptions are Site-19 and USGS-079, which have shown slight increases in the late 1990s (just above the detection limit approximately 400 pCi/L [much less than the MCL of 20,000 pCi/L]). The highest levels of tritium have historically been measured in USGS-065, possibly due to the stagnant lens of groundwater discussed earlier. Activities of tritium in USGS-065 dropped below the MCL in 1997.

In response to an agency review comment, tritium in the aquifer was corrected for radioactive decay in an attempt to better understand migration of sorbed contaminants. It was thought that decay-corrected tritium data could serve as a conservative tracer, moving in time with the water and giving insight to the fate and transport of nonconservative contaminants of concern in the subsurface. The effects of dilution, advective dispersion, and molecular diffusion are of primary interest. Ideally, tritium data can be decay-corrected (i.e., the decrease in concentration expected to occur due to the natural first-order radiological decay could be "added" to the observed concentration). Thus, the decay-corrected trend in tritium could be compared to the trend in chromium concentrations to provide some insight into differences and similarities between the fate and transport of sorbed and unsorbed contaminants.

The plot of the decay-corrected tritium appears higher over time; however, the decrease rate trend of the decay-corrected data is no more or less consistent with the chromium trend than the observed tritium data. No useful insight was gained as to the effects of dilution, dispersion, or diffusion through this approach. The plot of tritium decay-corrected data is not presented in this report, because the trend is very similar to measured values.

8.3.4.3 Strontium. Strontium data (Sr-90) obtained from groundwater samples from several aquifer wells near TRA (USGS-065, TRA-06A, and TRA-07) indicate that the strontium levels in the aquifer near TRA are below the 8-pCi/L MCL. The sample results were validated. Negative sample values, the result of analytical laboratory methods (wherein the laboratory counting equipment error is greater than

the measured sample concentration), were eliminated from the graph in Figure 25. Values assigned an undetect (U) data quality flag, including those samples whose counting error exceeded the measured concentration, were assigned a value of zero. These make up the majority of results for USGS-065; the entire historical record of strontium concentration in USGS-65 is presented in Figure 25 to emphasize the low Sr-90 in the aquifer beneath TRA.

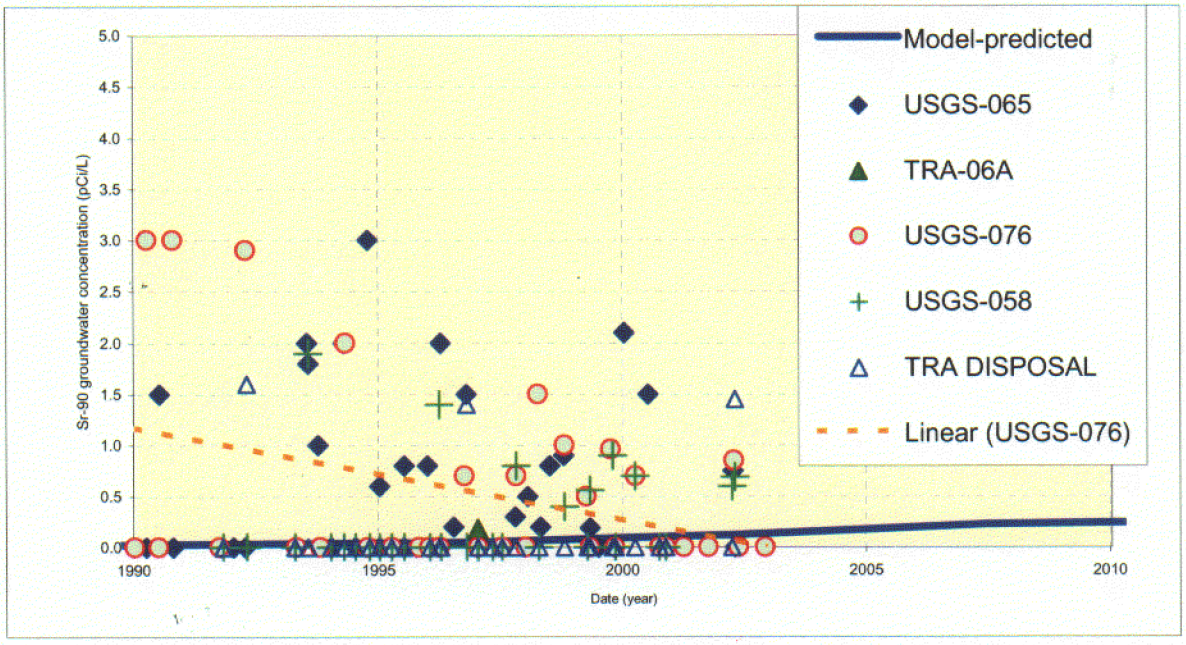

Figure 25. Strontium detections in groundwater samples from three aquifer wells near the Test Reactor Area.

With the exception of two dates (April 1976 [18+/-3 pCi/L, off scale in Figure 25] and April 1972 [9.1 pCi/L, no uncertainty given]), USGS-065 strontium concentrations have been below the MCL. The strontium concentration at USGS-065 is above the concentration predicted in the pre-Record of Decision model, which is shown as a light blue line in Figure 25. The pre-Record of Decision model predicted a peak activity in the aquifer near TRA of 0.305 pCi/L, occurring around the year 2050. The average groundwater concentration, for detected concentrations at USGS-065, for the entire period of record is 2.93 pCi/L; the most recent positive detection was 0.75 pCi/L in April 2002.

Fitting the USGS-065 strontium data with a linear trend line indicates the concentration will likely fall below the model-predicted concentration (0.23 pCi/L) by the year 2008. The one positive detection in Well TRA-07 is 0.75 pCi/L, which occurred in January 1996. This is above the model-predicted value of 0.05 pCi/L for this period but well below the MCL. The single positive detection in the TRA-06A aquifer well is 0.18 pCi/L, occurring in January 1997; this point also is above the model-predicted aquifer concentration of 0.05 pCi/L for this period but still well below the MCL. The difference in the modeled versus actual concentrations might be attributed to the presence of the shallow sedimentary interbed, which does not allow for complete mixing and dilution.

8.3.5 Monitoring Results Summary

Based on the review and trending of groundwater contaminants performed for this 5-year review, the summary of the water quality data is as follows:

- The Post-Record of Decision Monitoring Plan and the OU 2-13 Groundwater Monitoring Plan (Dames & Moore 1993; DOE-ID 2003) have identified Am-241, As, Be, Cd, Cs-137, Cr, Co-60, F, Pb, Mn, Sr-90, tritium, and Hg as contaminants of concern during the 5-year review period for the perched water system and the SRPA beneath the TRA. With the exception of Cr, H-3, Co-60, and Sr-90, it was determined that the other eight contaminants of concern have little impact on the perched water or the aquifer.

- Generally, tritium, Sr-90, chromium, and Co-60 have shown decreasing trends in deep-perched water wells over the past 5 years. Exceptions to the general decreasing trend include increasing or flat activities of Sr-90 in Wells PW-12, USGS-054, USGS-055, and USGS-070 as well as **a** recent increase of Co-60 in Well PW-12.

- The primary contaminants of concern identified for the SRPA are Cr and H-3. The other 10 identified contaminants of concern have low concentrations or are at nondetect levels and are considered to have no significant impact to the SRPA.

- Measured concentrations of chromium in the aquifer are decreasing and are expected to reach the MCL by 2012 for all wells.

- Tritium levels in all aquifer wells are below the MCL and are expected to continue to decrease due to radioactive decay and dilution.

- Based on the trend data for Sr-90 in the SRPA, it is expected to diminish and reach predicted concentrations, made by the pre-Record of Decision model, in the year 2008.

9. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

The engineered and native soil covers were intended to provide shielding from ionizing radiation or to prevent exposure to residual contaminated soil media. The annual inspections validated their structural integrity. Based on this 5-year review, all of the remedies and protective measures implemented at the surface OU 2-13 sites are functioning as intended. The covers placed over the Warm Waste Pond, Chemical Waste Pond, and Sewage Leach Pond are working as designed.

Institutional controls to limit access, which have been implemented at the OU 2-13 sites, continue to be effective. Annual inspections confirm that all institutional controls are in place and functioning as originally intended.

Natural radioactive decay, natural attenuation, dispersion, and monitoring of the SRPA indicate that the remedy is working and that chromium in wells with the highest concentrations will meet the MCL in about 2012 (estimated at 2016 in the OU 2-13 Record of Decision [DOE-ID 1997b]).

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

Of the contaminants of concern, no contaminant has had any major revision or update in toxicological criteria since the development of the final remediation goals that would decrease these goals. Therefore, once met, the final remediation goals (site-specific risk-based cleanup levels) will remain protective of human health and the environment under current exposure scenarios. Monitoring results show that most contaminant concentrations are well below the established final remediation goals.

The original assumptions, cleanup levels, and remedial action objectives used at the time of the remedy selection are still valid. The EPA has lowered the MCL for arsenic from 0.05 to 0.01 mg/L. However, compliance with the lower MCL does not have to be met until 2006. Data review showed that arsenic levels are below or near the MCL, with a maximum reported value of 0.014 mg/L. The objectives of inhibiting the exposure to radionuclide contaminants of concern and ingestion of hazardous contaminants of concern are effective, based on the review of the physical conditions of the constructed covers and groundwater monitoring results.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No new information has surfaced while compiling and reviewing the inspections, radiological survey, and groundwater monitoring data that would call into question the protectiveness of the implemented remedies.

9.1 Technical Assessment Summary

According to the data reviewed and the site inspections, the remedy is functioning as intended by the OU 2-13 Record of Decision (DOE-ID 1997b) and as modified by the Explanation of Significant Differences (DOE-ID 2000a). No changes in the physical conditions of the site have occurred that would affect the remedy's protectiveness. There have been no changes in the toxicity factors or **risk** factors for the contaminants of concern. Several issues have been identified that warrant further evaluation, however, at this time, there is no information that negates the remedy's protectiveness.

10. ISSUES

During the completion of this 5-year review, the following issues were identified:

1. Increasing activities of Sr-90 in Wells PW-12, USGS-054, USGS-055, and USGS-070 and a recent increase of Co-60 in Well PW-12 remain unexplained.

2. The original assumption at the time of the OU 2-13 Record of Decision (DOE-ID 1997b) was that the TRA facility would be decommissioned and decontaminated in 2007. Under a recent decision (2003) by DOE, TRA will remain active for at least another 20 years. Continued discharge to the Cold Waste Pond from TRA operations will cause the perched water systems to persist, and the effects on contaminant transport to the aquifer has not been evaluated.

3. Based on the analyses in this 5-year review, it might be appropriate to revisit the list of analytes monitored in groundwater and reduce the number of analytes to only include chromium, tritium, Sr-90, and Co-60 or to reduce the frequency of the monitoring.

4. Large fluctuations in water chemistry in perched water have been observed since the Record of Decision signature and are currently not understood.

5. The PW-13 perched water well continues to test positive for diesel.

6. The establishment and maintenance of desirable vegetation on native soil covers for the sewage leach pond and chemical waste pond are of concern.

11. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

1. *It is not clear what is causing the increase in concentrations of some contaminants of concern in the deep-perched water system.*

The following mechanisms should be considered in an evaluation of these trends. These include: (1) adsorption/desorption occurring with the changing perched water levels; (2) changing flow pathways in response to remediation and fluctuations in discharge to the Cold Waste Pond (or alternating cells); (3) seasonal variations of natural infiltration at a local scale; (4) variations in recharge from unidentified man-made sources; (5) lateral flux from the Big Lost River; or (6) new leaks of contamination from unidentified sources.

2. *A systematic analysis is recommended to positively identify the source of increasing Sr-90 in perched water as a new site.*

A new CERCLA site, TRA-63 (TRA-605 Warm Waste Line), was approved on February 6, 2003, by the State and EPA recommending a Track 1 investigation. The TRA-605 Warm Waste Line was repaired 6 years ago and again in 2002; it is believed that the line leaked warm waste to the environment and could be the source of the Sr-90 to the perched water system.

New sites have been identified at TRA since the OU 2-13 Comprehensive ROD was signed. The FFA/CO parties agreed that new sites identified at any INEEL facility area after signing of the ROD(s) for that facility would be handled administratively in 'OU 10-08. Each time a new site is identified, it is appropriately characterized and a determination made on whether near-term action is required. If near-term action is required, a removal action may be taken and then residual risk addressed in the OU 10-08 RI/FS. If a near-term action is not required, the site will be evaluated in the OU 10-08 RI/FS and the remedy selected in the OU 10-08 ROD. The protectiveness of OU 2-13 remedies has been reviewed within the context of ROD requirements. Effects from new sites and potential new sites have been included in the issues listed in Section 10, but the remedies for the new sites are not part of the OU 2-13 ROD and the 5-year review cannot determine if new site remedies are protective. Discussions in the facility specific 5-year reviews will support the analysis of that RYFS. The OU 10-08 RI/FS will determine the cumulative impacts of past operations on the aquifer, while risks from releases discovered post-ROD(s) signature will be evaluated as new sites under WAG-10.

3. *The OU 2-13 Groundwater Monitoring Plan (DOE-ID 2003) should be revised to reflect changing conditions based on the groundwater quality and water level monitoring data.*

Only four contaminants of concern continue to warrant continued semiannual groundwater monitoring; these include Cr, H-3, Sr-90, and Co-60. Interpretation of water level data was problematic during this 5-year review because of infrequent measurements in a dynamic groundwater system. The feasibility of using electronic water-level recorders should be assessed to monitor for dynamic changes in water levels and correlate them to discharges to the ponds. The IDEQ recommended one round of sampling for Iodine-129 and Technetium-99 during the first review of this document; this will be

incorporated into the revision of the OU 2-13 Groundwater Monitoring Plan. Recently drilled Middle-1823 should be added to the TRA groundwater-monitoring network. The well is screened from 680 to 720 ft bgs, and it will serve to further constrain the vertical and lateral migration of contaminants, particularly chromium.

4. **A** *geochemistry investigation is recommended to "fingerprint" various water sources at TRA and correlate sources to water in perched water wells.*

For instance, the presence or absence of sulfate in wells and recharge sources might be used to tie certain wells to specific recharge sources. Operations at TRA might have a strong impact on water chemistry. Better communications with Operations personnel on the day-to-day discharges to the ponds should be encouraged to enhance interpretations of water levels and water chemistry and document the flux of water to the vadose zone. The geochemistry analyses should look at variations in redox conditions that might change the mobility of contaminants, particularly chromium.

5. *The impact of continued operations at the TRA facilities for another 20 years and the continued persistence of perched water should be used to update, if required, the assumptions of the pre-Record of Decision model.*

Ideally, information gained from the preceding paragraphs could be used in this evaluation. In addition, a field characterization effort is needed to identify the extent and source of the diesel in PW-13.

6. *Establishment of desirable native vegetation and control of intrusive weed species should be addressed more aggressively.*

These actions would enhance the covers' structural integrity by providing greater resistance to erosion and animal intrusion, which would provide greater protection to human health and safety and the environment. Recommendations and actions are being identified to improve or enhance remedy performance or protectiveness in accordance with the remedial action objectives and performance standards identified for these sites.

12. PROTECTIVENESS STATEMENT

The implemented remedies from the OU 2-13 Record of Decision (DOE-ID 1997b) continue to **be** protective of human health and the environment based on the data and analyses presented in this report. The **U.S.** Environmental Protection Agency **(EPA)** with consultation from the Idaho Department of Environmental Quality (IDEQ retains final authority over whether the 5-year review adequately addresses the protectiveness of remedies. Potential short-term threats are being addressed through institutional controls. Long-term protectiveness of human health and the environment under the Record of Decision was determined based upon concentrations predicted in the aquifer (not in perched water). Trends for contaminants of concern measured in the aquifer during this first 5-year review period either are currently below the MCLs or are projected to be below the MCLs in 2012. Thus, the chromium concentrations in all wells will be below the MCL 4 years in advance of the pre-Record of Decision model that predicted the concentration of chromium to reach the MCL by 2016. Issues identified in this 5-year review related to perched water are not expected to affect the protectiveness of the selected remedies. Ongoing discussions with the Agencies will define activities to fully evaluate the perched water conditions and long-term impacts on the aquifer. Long-term protectiveness will be satisfied under the selected remedy when groundwater cleanup goals are achieved, estimated to occur in the year 2012.

13. NEXT REVIEW

The next 5-year review for the Test Reactor Area, Operable Unit 2-13 is required by December 21,2007 — 5 years from the date of this review.

14. REFERENCES

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